

# **TECH** **Missouri** TECHNOLOGY TRANSFER ASSISTANCE PROGRAM **Transportation** **Bulletin**

■ Research, Development & Technology Division  
Missouri Department of Transportation  
■ Federal Highway Administration  
■ Local Technical Assistance Program

Vol. 15, No.4

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## **GPS Seminar held in Jefferson City**

During the last decade, transportation agencies have integrated the benefits of Geographic Information Systems (GIS) and Global Positioning System (GPS) technologies into their transportation planning and project development. The use of these technologies to address the aspects of transportation is just beginning. Missouri Department of Transportation (MoDOT), in cooperation with other municipal agencies, are finding that collaboration is key to the successful application of these technologies.

The use of GPS receivers has simplified the collection of spatial data in the field by providing both a position and a means of entering descriptive attributes. There are many types of GPS receivers on the market and a user must know the desired accuracy and the amount of descriptive data necessary to satisfy their database before choosing one.

### **Wastewater Division Acquires GPS Unit.**

The City of Jefferson, Department of Public Works, Wastewater Division acquired a TRIMBLE PATHFINDER PRO XR GPS unit to map the wastewater facilities in digital form. The unit is used to locate features with submeter accuracy.

The Wastewater Division will be collecting facility locations to map into the city's GIS. Currently the sanitary sewer atlas is not in digital form and manhole locations on the atlas are a general reference location. With this system the manholes and structures will be mapped to submeter accuracy and be placed in the digital GIS database. While collecting the locations of the manholes, the manhole type, condition, inflows, and outflows will be inspected.

### **Seminar**

A GPS Seminar was held on Wednesday, August 4th, 8:30 a.m. - Noon.

Presenter: Tim Newton- MoDOT.

Mr. Newton, a Geotechnical Liaison in the Materials Division of MoDOT, presented a 1/2 day seminar on GPS technology.

### *Agenda Included:*

- Overview of GPS and the corresponding receiver equipment was presented for persons working with spatial data or GIS.
- Differential corrections and the correlation of accuracy and positioning methods were explained.
- Information was based on GPS receiver equipment and application evaluation by MoDOT's Divisions of Research, Development & Technology and Materials.

For more information on GPS training, please contact this office at (573) 751-0852 or (573) 526-5381.



Pat Kliethermes (center) of the Jefferson City Public Works Department demonstrates how to locate a point using the GPS receiver.

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# Dealing With Washboarding

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One of the most aggravating gravel maintenance problems that plagues grader operators, managers, and elected officials is Corrugation. The slang term often used in the field is “washboarding.” It is an appropriate description, because driving on a corrugated gravel surface is much like driving over a giant washboard. This problem generally brings more complaints from the public than any other gravel maintenance problem. It not only produces an uncomfortable ride, but moderate to severe washboarding can cause a driver to have reduced control of his/her vehicle. It actually becomes a safety problem.

## Causes:

It is impossible to deal with the problem of washboarding if you don't clearly understand what the causes are. There is not one single cause. The causes of the problem can be put in three general categories. Before we discuss these categories, we need to eliminate a myth that exists in the minds of many people. That myth is that motorgraders cause washboarding. They do not! It is true that graders can cut certain distortion into a gravel surface, but this distortion will never look like the corrugated surface in the photo on page one. When an operator runs a grader too fast, the machine can begin to “lope” or bounce. The humps and dips this causes will be farther apart and will be cut at an angle across the roadway - the same angle that the moldboard is adjusted to while blading.

We can now discuss the three main causes of washboarding.

### 1. Lack of moisture.

When frequent rainfall occurs, washboarding is greatly reduced. But that is not guaranteed and in high

traffic areas just a few days without rain can really cause problems. Prolonged dry weather can cause washboarding in almost any situation, even with relatively low traffic.

### 2. Traffic

This can be more specifically defined. People's driving habits can really aggravate the problem. Hard acceleration or hard braking are the greatest problems. Because of this, washboarding will generally appear first at locations such as intersections, coming into or going out of sharp curves, business entrances, and sometimes even at driveways. As vehicle tires lose a firm grip on the road and begin to spin or skid just a little, a slight amount of gravel will be displaced. After this is repeated a number of times, the material will align itself into the “washboard” pattern. A US Forest Service study has shown that light vehicles with small wheels and light suspensions cause more washboarding than trucks.

### 3. Poor Quality of Gravel.

There are several things to consider in determining quality. Washboarding will almost certainly develop if the surface gravel has poor gradation, little or no binding characteristic, and a low percentage of fractured stone.

Other causes could be discussed, but the three just mentioned are definitely the primary ones.

*See Free Publications for More Information*

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# Transportation Industrial Alliance:

A New Program for Product Implementation

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The Transportation Industrial Alliance (TIA) is a new national LTAP initiative to help local governments deal with implementing products. Developed by the 58 Local Technical Assistance Programs (LTAP), TIA has three programs to improve information exchange between people who produce the product or technique and those who might use them.

1. Product Demonstration. The best way for local agencies to evaluate new road and bridge training, products and services is to evaluate them under everyday local conditions.

2. Test Site Registration. Sites are often needed by researchers to reinforce the benefits of a product found in a laboratory or to fine tune it. Towns, cities and the VAOT can participate in this test phase and benefit from the results by registering as a possible test site in an area of need.

3. Case Study Resource Center. TIA is establishing a one-stop national Case Study Resource Center which will contain user/vendor case histories on a variety of topics. Information will be available by topic, specific item, by state and by region.

All public transportation and related agencies are automatic TIA members and eligible for services either through Vermont Local Roads or directly from the TIA at no charge. Private entities participate in TIA through various membership opportunities.

For more information you may contact:

Gib Peaslee, TIA Membership Coordinator, Transportation Industrial Alliance, University of Florida  
512 Weil Hall, P.O. Box 116585  
Gainesville, FL 32611-6585  
Telephone: (352) 392- 2371 ext. 245  
Fax: (352) 392-3224  
Email: Alliance@ce.ufl.edu

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# Guide for the Development of Bicycle Facilities

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Bicycle travel has played an historic role in transportation. Even before the invention of the automobile, the League of American Wheelmen promoted improved traveled ways.

Increasingly, transportation officials throughout the United States are recognizing the bicycle as a viable transportation mode. While recreational cycling is still the primary use of bicycles in this country, the number of people using bicycles for commuting and other travel purposes has been increasing since the early 1970's. Nationwide, people are recognizing the energy efficiency, cost effectiveness, health benefits and environmental advantages of bicycling.

Local, state and federal agencies are responding to the increased use of bicycles by implementing a wide variety of bicycle-related projects and programs. The emphasis now being placed on bicycle transportation requires an understanding of bicycles, bicyclists and bicycle facilities. A new "Guide For The Development of Bicycle Facilities" addresses these issues and clarifies the elements needed to make bicycling a viable transportation alternative.

Research continues to provide additional criteria for the design of appropriate bicycle facilities. The selection of a bicycle facility may depend on many factors, including vehicular and bicycle traffic characteristics, adjacent land use and expected growth patterns.

The Bicycle Guide consists of: Chapter 1 provides an overview of planning considerations for bicycles, a discussion of types of facility improvements and a description of factors to consider when locating a facility. Chapter 2, which is organized around the various types of bicycle facilities, provides guidelines to

follow when constructing or improving highways and designing and constructing bicycle facilities. Chapter 3 provides recommendations for the operation and maintenance of bicycle facilities. The Appendix reviews the legal status of bicycles under the Uniform Vehicle Code (UVC3).

## Purpose

Safe, convenient and well-designed facilities are essential to encourage bicycle use. This guide is designed to provide information on the development of facilities to enhance and encourage safe bicycle travel. The majority of bicycling will take place on ordinary roads with no dedicated space for bicyclists. Bicyclists can be expected to ride on almost all roadways, as well as separated shared use paths and even sidewalks, where permitted to meet special conditions.

This guide provides information to help accommodate bicycle traffic in most riding environments. It is not intended to set forth strict standards, but rather, to present sound guidelines that will be valuable in attaining good design sensitive to the needs of both bicyclists and other highway users. However, in some sections of this guide, design criteria includes suggested minimum guidelines. These are recommended only where further deviation from desirable values could result in unacceptable safety compromises.

## Scope

This book provides part of the information necessary for a safe bicycling environment. Facilities are only one of several elements essential to a community's overall bicycle program. Bicycle safety education and training, encouraging bicycle use, and the application and enforcement of the rules of the road as they pertain to bicyclists and motorists should be combined with facilities to form a comprehensive community approach to bicycle use. This guide provides information on facilities. Information on other elements of an overall bicycle program can be obtained from state or local bicycle coordinators and other publications.

The provisions for bicycle travel are consistent with, and similar to, normal highway engineering practices. Signs, signals and pavement markings for bicycle facilities which are presented in the Manual on Uniform Traffic Control Devices (MUTCD<sup>2</sup>) should be used in conjunction with this guide. For construction of bicycle facilities, state and local construction specifications should be used.

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## Historical Bridge Available

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**Gasconade and Montgomery Counties, MO:** "Hermann Bridge" over the Missouri River is available for adaptive reuse in place. If ownership of the bridge is transferred to another party, the transfer deed will include preservation covenants that require the new owner to preserve and maintain the bridge in accordance with the recommended approach in "the Secretary of Interior Standards for Rehabilitation and Guidelines for Rehabilitating Historic Bridges." Monies may be available for reuse of the bridge.

**Description:** The National Register of Historic Places eligible bridge was constructed in 1928-1930 by the National Toll Bridge Company and designed by L.J. Sverdrup. This 2,232-foot bridge is a steel, rigid-connected cantilevered Warren through truss with seven 400-foot spans and a 20-foot roadway width.

Interested parties should contact Randall Dawdy, Preliminary Studies Division, Cultural Resources Section, Missouri Department of Transportation, P.O. Box 270, Jefferson City, Missouri 65102, phone (573) 526-3591, or FAX (573) 526-1300, by November 30, 1999.

# Winter Training Workshops

## 2000 Roadside- Herbicide Certification Training

Training for applicators certification (Certified Public Operators") will be offered to city and county personnel in conjunction with Missouri Department of Transportation employees again this year. Tech Tran will sponsor (cover the cost of training) a limited number of local agency personnel by furnishing the reference manuals and the 1-day training.

This training session pertains to pesticides and their application for right-of-way brush control. The topics to be covered during the training will be:

*Pests and Pest Control*

*Pesticides and Formulations*

*Pesticide Labels and Restricted Use*

*Environmental Concerns*

*Pesticide Movement in the Environment*

*Managing Pesticide Wastes*

*Health Concerns When Using Pesticides*

*Pesticide Application and Your Safety*

*Laws and Regulations*

*Plant Biology and Recognition*

*Herbicides*

*Application Equipment and Formulation*

### Testing

There will be no testing during the one day training session. The Department of Agriculture schedules testing locations and dates throughout the state during the year.

## 2000 Certification Training (One Day Program)

**Tuesday, January 18, 2000**  
Columbia, Missouri

**Wednesday, January 26, 2000**  
St. Louis, Missouri

*See LTAP Registration Form*

Reservations for training need to be made through Tech Tran Registration Form. Questions call (573) 526-5381 or Fax: (573) 526-4337.

## 2000 Herbicide Recertification

Certified Public Operator License Recertification will be on the dates and locations listed below:

**Tuesday, January 11, 2000**  
Springfield, Missouri

**Thursday, January 13, 2000**  
Kansas City, Missouri

**Thursday, January 20, 2000**  
Columbia, Missouri

**Thursday, January 27, 2000**  
St. Louis, Missouri

The Missouri Pesticide Use Act requires all Licensed Pesticide Technicians to participate in additional training within three years from initial licensure (check the RETRAINING DATE on your pesticide license) and within each subsequent three year period. Participation in RECERTIFICATION training will meet this requirement.

Questions regarding recertification, please contact Paul Bailey, MO Department of Agriculture at (573) 751-5504 or (573) 751-5509.

Short Course:

## Asset Management for Local Governments

When: Thursday, November 18, 1999  
Registration at 9:30 a.m.

Course: 10:00 a.m. to 3:00 p.m.

Where: UMKC University Center,  
5100 Rock Hill Road, Kansas  
City, MO

Cost: \$25.00 (includes lunch)

The University of Missouri is presenting a 5-hour short course on a user friendly system aimed to assist local government managers and maintenance personnel in making more informed, cost-effective decisions about the infrastructure components for which they are responsible.

Dr. Kristen Sanford Bernhardt from UM-Columbia and Dr. Ali Roohanirad from Jackson County Missouri Public Works will draw on the principles of relational data bases, condition assessment, condition performance and management alternatives included in more formal Asset Management literature and apply it in a very easy to use "hands on" package for local governments.

### Course Outline

What is Asset Management and why is it important?

- impact of maintenance and construction practices
- keep to scale of local government programs

Technical Asset Management Components

- Inventory - Condition Assessment
- Condition Performance - Alternative Solutions
- Economic Evaluations - Programming Priorities
- Evaluation and Feedback

Lunch

Tools for Asset Management

Case Study Exercise - Team Solutions

Summary - Including handouts, computer applications, GIS applications

- Questions and Answers

Early registration is suggested as the course space is limited to 40 participants. Please send registrations to: **Transportation Infrastructure Center** - UMC, E2509, Engineering Building East, Columbia, MO 65211. Call Charlie Nemmers at (573) 882-0071 if you would like more information.

## Registration Form

This form is for use by local agency personnel scheduling LTAP Training.

Course \_\_\_\_\_

Date(s) \_\_\_\_\_

Contact Person \_\_\_\_\_

Title \_\_\_\_\_ Phone No. \_\_\_\_\_

Name of Agency \_\_\_\_\_

Address \_\_\_\_\_

(Street/P.O. Box)

(City)

(State)

(ZipCode)

### EMPLOYEE(s) YOU WISH TO REGISTER

Name \_\_\_\_\_ Title \_\_\_\_\_

Name \_\_\_\_\_ Title \_\_\_\_\_

Name \_\_\_\_\_ Title \_\_\_\_\_

Each registrant scheduled to attend this course will be sent a confirmation notice and registration based on space available/session.

**Please mail to:**      **Research, Development and Technology Division**  
**MoDOT, Training Registration-LTAP**  
**P.O. Box 270, Jefferson City, MO 65102**  
**Fax (573) 526-4337**

## Why is Access Management Important?

Managing access can often reduce the number of accidents in the managed area by 50-60%.

Many engineers and planners observe that when conventional highways are constructed on new rights-of-way, initially, there are few commercial driveways, and the safety record is good. As highways get older, traffic volume builds up, roadside businesses develop, more and more commercial driveways are cut, and accident rates gradually increase.

Access management is managing how, when and where vehicles can turn onto or off of a road. It includes providing access to land development while simultaneously preserving the flow of traffic on the surrounding road system in terms of safety, capacity, and speed. There is often a 50-60%

reduction in accidents in areas in which access is managed.

Access control regulations should address driveway, intersection, and signal spacing, the denial of access requests where necessary, and geometric design (including turn lanes). Access standards vary; they allow greater access and lower design standards on slower collectors and more restrictive access and higher standards on faster arterials with larger traffic volumes.

There are six general benefits that can be derived from competent access management.

1. Improved traffic flow
2. Improved fuel economy
3. Fewer accidents
4. Reduced vehicle emissions
5. Reduced delay

### 6. Increased capacity

Decreasing the number of unexpected events and separating decision points reduces accidents. This is accomplished by increasing the spacing of those points at which a decision must be made by a driver, for example, whenever another vehicle is encountered. This is especially important at intersections at which the other vehicle is traveling at a slower speed than the through traffic.

In other words, an increase in the number of intersections or driveways with an increase in traffic volume at those intersections may also increase the accident rate. Approximately 65% of driveway accidents are related to left turns. Good access management will maintain the roadway function, while separating the various roadway users.

Here are some of the techniques commonly used:

- \* Medians
- \* Joint Use Access
- \* Channelization
- \* Deceleration lanes
- \* Acceleration lanes
- \* Consolidating access
- \* Driveway spacing
- \* Corner clearance
- \* Frontage roads
- \* Visual clues for driveways
- \* Maintaining proper sight distance
- \* Continuous two-way left-turn lanes

Using these tools effectively can limit the number of conflict points a driver experiences during travel. It can also separate the conflict points that cannot be eliminated and remove slower turning vehicles from the traffic lanes.

The issue involved can be quite complex and controversial. Property owners and developers may not like to have restrictions placed on their access. However, agencies must weigh the public good against private benefit.

Adapted from an article in the Colorado LTAP's *The Wheel*.

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# Scope of Services

## Traffic Engineering Assistance Program (TEAP)

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This program is in place whereby local public agencies can receive engineering assistance through the Traffic Engineering Assistance Program (TEAP).

*The scope of services is as follows:*

### **Purpose**

The safe and efficient flow of traffic and the safety of pedestrians and bicyclists are major concerns to the local public agencies of Missouri. These public agencies need to conduct accurate and timely traffic studies to determine effective countermeasures for these concerns. Many of these local agencies and their political subdivisions have neither the funds nor the engineering expertise necessary to conduct expert traffic engineering studies.

As a result, the Missouri Highway and Transportation Commission has developed the TRAFFIC ENGINEERING ASSISTANCE PROGRAM to provide Missouri local public agencies with the assistance necessary to proficiently study traffic engineering problems.

The services of this program are to be used for locations on public roads under the jurisdiction of local public agencies which are located off of the State System. TEAP services are not intended to duplicate services already available to local agencies through the MoDOT district or Central Office. The consultant services provided under this program are intended to maximize the availability of professional advice or services to local public agencies with technician and drafting time minimized.

### **Personnel**

The traffic engineering expertise nec-

essary to provide this assistance to the local public agencies and their political subdivision will be provided from a pool of pre-qualified engineering consultants. The consultant firms selected from the pre-qualified pool will be required to use engineering personnel having a background in traffic engineering with actual traffic engineering field experience on state, county or city roadway projects.

### **Administration**

The direction of this program will be under the jurisdiction of the Department's District Engineer, with coordination of the statewide consultant contract and technical policy interpretation being provided by the Traffic Division in the Central Office. The statewide contract is normally in effect for a three-year period, after which time it may be renegotiated or renewed.

A political subdivision facing a traffic operational problem, and desiring to participate in the program, should contact the District Engineer having responsibility for the State Highway System in that particular political subdivision. The District Engineer shall decide, based on the description of the problem, whether to utilize consultant personnel. The District's authorized representative or local agency will discuss the problem with the Consultant in order to prepare a Project Tracking Form and a fee estimate on a TEAP Project Estimate Form for further eligibility review by the District and the Traffic Division in the Central Office.

If the project is found to meet eligibility and program cost requirements, the tracking form is returned to the district so that the Consultant can be notified to proceed. In the event the project does not meet eligibility and/or program cost requirements, the Traffic Division in the Central Office will notify the Consultant directly.

Upon completion of the traffic engi-

neering investigation, the political subdivision, District office, and the Traffic Division in the Central Office will be advised of the Consultant's findings in a letter report. The letters, and any attachments, will be signed and sealed by a registered professional engineer, registered in the State of Missouri.

All announcements, printings, and advertisements shall list the Missouri Division of Highway Safety, the Missouri Department of Transportation, and the Federal Highway Administration as program sponsors.

### **Financial Considerations**

The services of the program are generally provided at a 20% cost to requesting, eligible local public agencies in Missouri. Federal Highway Safety Funds (HSP) and Local Technology Assistance Program Funds (LTAP) will be used for the remaining 80% of expenditures. Federal Highway Safety Funds (HSP) are administered by the Missouri Division of Highway Safety and coordinated by the Missouri Department of Transportation. Local Technology Assistance Program Funds (LTAP) are administered by Missouri Department of Transportation. It is the responsibility of the Consultant to invoice and secure payment of the political subdivision's portion of their project costs.

If a project is approved, the consultant selected by the local agency will be reimbursed in accordance with the agreed hourly rates and actual direct non-salary costs as set forth in the Agreement. The consultant will be reimbursed for his actual costs incurred in performing each project to the extent authorized in the contract. Authorized actual costs include the consultant's direct personnel salary costs plus fringe benefits, travel, and other expenditure costs if directly related to this project and a pro-rated portion of his indirect or administrative overhead. In addition, the Consultant will be compensated for a pre-

specified percentage profit for performing the services of this program. For the convenience of the consultant and the department, an agreed hourly rate will be used in the contract that reflects actual costs.

Each particular project must receive prior approval from the District and Central office. This requires that the Consultant submit a Project Tracking Form and a TEAP Project Estimate Form to the District outlining the work to be performed. The TEAP Project Estimate Form shall outline project hours anticipated by personnel classification and by task (field or office review, report preparations, travel time, etc.). Development of these forms should be done based on the consultant's initial contact with the local agency or district. If a project is approved, costs for travel expenses and personnel time required for one site inspection during the course of the project are normally eligible for reimbursement.

The Consultant shall invoice the Traf-

fic Division in the Central Office for their services. Division personnel will, upon verification of the eligible charges, authorize the payment be made to the consultant.

### Local Agency Responsibilities

- Ø Identify problem
- Ø Initiate request for TEAP assistance
- Ø Provide assistance to consultant during the course of the project. (Examples are traffic control, traffic counts, assisting in any physical measurements needed)

### Consultant Responsibilities

- Ø Traffic Accident Analysis
- Ø Traffic Control Devices Inventory Application and Layout
- Ø Traffic Signal Progression Analysis and Design
- Ø Speed Surveys
- Ø Minor Origin and Destination Studies
- Ø Traffic Counts
- Ø Parking Supply and Demand
- Ø Capacity Analysis

### TEAP Consultants

George Butler Associates, Inc.  
1100 Main Street, Suite 1100  
Kansas City, MO 64105

HDR Engineering, Inc.  
4435 Main Street, Suite 450  
Kansas City, MO 64111

Shafer, Kline & Warren  
2940 Main Street  
Kansas City, MO 64108

Wilson & Company Engineering & Architects  
3101 Broadway, Suite 950  
Kansas City, MO 64111

TranSystems Corporation  
4600 Madison Avenue, Suite 500  
Kansas City, MO 64112

Crawford, Bunte, Brammeier  
1830 Craig Park Court, Suite 2089  
St. Louis, MO 63146

Larkin Associates Consulting Engineers, Inc.  
9233 Ward Parkway, Suite 300  
Kansas City, MO 64114

Traffic Engineers, Inc.  
3226 South Jefferson Avenue  
Springfield, MO 65807

Detach and mail

## Free Publications

The publications listed are available free from Tech Tran. Place a checkmark by the titles you wish to receive, print your name, agency and address where indicated and mail to Tech Tran.

\_\_\_ "The Benefit of Testing Aggregates". The purpose of this bulletin, is to simply define the benefits of knowing more about the aggregate, often simply called gravel, that is used in construction and maintenance operations. (South Dakota Department of Transportation, Special Bulletin #33).

\_\_\_ "Dealing With Washboarding". It is impossible to deal with the problem of washboarding if you don't clearly understand what the causes are. There is not one single

cause. The causes of the problem can be put in three general categories which this bulletin discusses. (South Dakota Department of Transportation, Special Bulletin #29).

\_\_\_ "Calming Neighborhood Traffic". Traffic calming uses a combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior, and improve conditions for users of the streets who are not using vehicles. It is important to remember there is a right and a wrong way to apply the techniques. (Virginia Transportation T2 Center, June 1999).

\_\_\_ "Improving Roads by Improving Communication: How to 'Sell' A Road Improvement Program to the Voters". This technote outlines the steps local leaders can take to improve their communication from the beginning of a road improvement plan to the time of budget making and voter approval. (Baystate Roads Program - Tech Note #17).

\_\_\_ "The Ins and Outs of Access Management". What is Access Management, how does it work, what can it do for you, and where can you get more information? Municipalities have limited control over access points at retail centers like malls, but they can be a high source of accidents. (KUTC Newsletter, Spring 1998).

Please print your name and address below, then detach and mail to:

Missouri Department of Transportation,  
Technology Transfer Assistance Program,  
P.O. Box 270, Jefferson City, MO 65102

Name

Agency

Address

City

State

Zip

Phone

Missouri Department of Transportation  
Technology Transfer Assistance Program  
Local Technical Assistance Program  
P.O. Box 270  
Jefferson City, MO 65102

Telephone  
573-751-0852

Address Correction Requested

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## Future Events

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### **November 17-18, 1999**

42nd Annual UMR Asphalt Conference

University of Missouri-Rolla

Contact: Dr. David N. Richardson

Phone: (573) 341-4487

### **October 16-18, 2000**

17th Annual National Roadside  
Vegetation Management Association  
Conference

Kansas City Marriott Downtown

Kansas City, Missouri

Contact: Stacy Armstrong

Phone: (573) 751-8647

The Missouri Transportation Bulletin is published by the Technology Transfer Assistance Program of the Missouri Department of Transportation, Jefferson City, Missouri. The opinions, findings or recommendations expressed in this Bulletin are not necessarily those of MoDOT or the Federal Highway Administration.

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